PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

PERMIT SUMMARY SHEET

Permit No.: 0210002, C-10913

Source Name: Empire District Electric, Co. (Empire) Riverton Power Station

Source Location: 7240 Southeast Highway 66, Riverton, Kansas 66750

I. Area Designation

K.A.R. 28-19-350, Prevention of significant deterioration of air quality, affects new major sources and major modifications to major sources in areas designated as "attainment" or "unclassifiable" under section 107 of the Clean Air Act (CAA) for any criteria pollutant. The State of Kansas is classified as attainment for the National Ambient Air Quality Standards (NAAQS) for all the criteria pollutants.

Cherokee County, Kansas, where this modification is taking place, is currently in attainment or unclassifiable for all pollutants. As such, the PSD program, as administered by the State of Kansas under K.A.R. 28-19-350, will apply to the proposed project.

II. Project Description

The Empire District Electric Company (Empire), Riverton Unit 12, a Siemens V84.3A(2) natural gas-fired combustion turbine, nominally rated at 150 MW, was originally issued a construction permit on October 18, 2005 (amended on August 18, 2006 and February 5, 2009) and began operation in 2007.

Empire plans to convert the Riverton Unit 12 to a combined cycle turbine, with a nominal capacity of 250 MW. The proposed combined cycle unit will replace the capacity and energy provided by coal fired boilers Unit 7 (426 MMBtu/hr) and Unit 8 (600 MMBtu/hr), which will both be retired in conjunction with the completion of this project. Empire plans to complete this conversion by June, 2016.

Modifications will include a heat recovery steam generator (HRSG) with supplemental natural gas duct firing (duct burners) and a condensing steam turbine generator. A selective catalytic reduction (SCR) system will control oxides of nitrogen (NO_x). A carbon monoxide catalyst will control carbon monoxide (CO) and volatile organic compound (VOC) emissions from the turbine and HRSG. Other equipment will include a cooling tower, an 18.6 MMBtu/hr natural gas-fired auxiliary boiler with the capacity to produce 15,000 pounds of steam per hour (approximately 18.6 MMBtu/hr), a 1102 HP (750 Kw) emergency diesel engine and two (2) sulfuric hexafluoride (SF_6) insulated circuit breakers. Except in the case of an actual emergency, Empire will not operate the emergency diesel engine more than 100 hours per year in a non-emergency capacity to accommodate maintenance and readiness testing.

Emissions increases of NO_x, sulfur dioxide (SO_2), carbon monoxide (CO), volatile organic compounds (VOC), particulate matter (PM), PM with a diameter less than 10 microns (PM_{10}), PM with a diameter less than 2.5 microns ($PM_{2.5}$), lead, sulfuric acid mist (SAM), hydrogen fluoride (HF), and carbon dioxide equivalent (CO_2e) were evaluated for this review. This is a major modification of a major stationary source for at least one regulated pollutant emitted in excess of the PSD significant emission levels. Since there is an increase in PM, PM_{10}, $PM_{2.5}$, and CO_2e emissions in excess of the significant thresholds, the proposed modification will be subject to the requirements of 40 CFR 52.21, Prevention of Significant Deterioration (PSD) as adopted under K.A.R. 28-19-350.

This project is subject to K.A.R. 28-19-300 (Construction permits and approvals; applicability) because the increase in potential-to-emit of PM exceeds 25 tons per year and PM_{10} exceeds 15 tons per year. Riverton Unit 12 is an affected source subject to Title IV of the Federal Clean Air Act, Acid Deposition Control. The emergency diesel engine is subject to the requirements of 40 CFR 60, Subpart IIII, Standards of Performance for Stationary Compression Ignition (CI) Internal Combustion Engines. An air dispersion modeling impact analysis, an additional impact analysis, and a Best Available Control Technology (BACT) determination were conducted as a part of the construction permit application process.

III. Significant Applicable Air Emission Regulations

The following significant Kansas air quality regulations were determined to be applicable to this source:

A. K.A.R. 28-19-11, Exceptions due to breakdown or scheduled maintenance – as applied to state regulations K.A.R. 28-19-30 through 32 and K.A.R. 28-19-650.

B. K.A.R. 28-19-30 through 32, Indirect heating equipment emissions.

C. K.A.R. 28-19-275, Special provisions; acid rain deposition.

D. K.A.R. 28-19-300, Construction permits and approvals; applicability.

E. K.A.R. 28-19-350, which adopts by reference 40 CFR 52.21, Prevention of significant deterioration of air quality.

F. K.A.R. 28-19-650, Emissions opacity limits.

G. K.A.R. 28-19-720, which adopts by reference 40 CFR Part 60, New Source Performance Standards.

H. K.A.R. 28-19-750, which adopts by reference 40 CFR Part 63, National Emission Standards for Hazardous Air Pollutants.

I. 40 CFR Part 60, Subpart A, General Provisions.

J. 40 CFR Part 60, Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines.

K. 40 CFR Part 63, Subpart A, General Provisions.

L. 40 CFR Part 63, Subpart ZZZZ, National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines.

M. 40 CFR Part 63 Subpart YYYY, National Emission Standards for Hazardous Air Pollutants from Stationary Combustion Turbines. Subpart YYYY, 63.6145 requires initial notification. In accordance with 63.6095(d) there are no other applicable requirements of the subpart until EPA takes final action to require compliance and publishes a document in the Federal Register. As of the date on this application, the EPA has not published such a document in the Federal Register.

N. 40 CFR Part 60 Subpart KKKK, Standards of Performance for Stationary Gas Turbines, applies to stationary combustion turbines with a heat input at peak load equal to or greater than 10 MMBtu/hr, based on the higher heating value of the fuel, which commenced construction, modification, or reconstruction after February 18, 2005.

O. 40 CFR Part 60 Subpart Dc, Standards of Performance for Small Industrial Commercial-Institutional Steam Generating Units applies to the auxiliary boiler. Since the auxiliary boiler will fire solely natural gas it will only be subject to the Reporting and Recordkeeping requirements of 40 CFR Part 60, Subpart Dc (40 CFR 60.48(c).

P. 40 CFR Part 63 Subpart 40 CFR Part 63 Subpart DDDDD Industrial, Commercial, and Institutional Boilers and Process Heaters (Boiler MACT) apply to the auxiliary boiler. Since the auxiliary boiler would fire solely natural gas it will not be subject to any emissions limits, but rather would be subject to a work practice standard that requires an annual tune-up in lieu of emission limits.

Q. 40 CFR Part 72 through Part 78, Acid Rain Program (ARP), applies to utility units. A utility unit is defined as a unit owned or operated by a utility that serves a generator in any state that produces electricity for sale. Unit 12, when converted to a combined cycle operation, will continue to be subject to the ARP. The ARP requires various pollutant monitors in addition to possession of SO_2 allowances for each ton of SO_2 emitted. The current ARP permit, under which unit 12 currently operates will be modified as the project is completed

IV. Air Emissions from the Project

The potential-to-emit of at least one of the PSD regulated pollutants from the existing Riverton Power Station exceeds 100 tons per year. Hence, Empire is considered to be a major stationary source under provisions of K.A.R. 28-19-350.

The total projected emissions increases from the proposed modification are listed in Table 3-0 of Section 3.0 and detailed out in Appendix A of the application. Proposed projected emissions increases of oxides of nitrogen (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), volatile organic compounds (VOC), particulate matter (PM), PM with a diameter less than 10 microns (PM_{10}), PM with a diameter less than 2.5 microns ($PM_{2.5}$), lead, sulfuric acid mist (SAM), hydrogen fluoride (HF), and carbon dioxide equivalent (CO_2e) were compared with the Significant Emission Rates for PSD applicability for the criteria and non-criteria pollutants. The projected emissions increase is above the PSD significance level for PM, PM_{10}, $PM_{2.5}$, and CO_2e and will be reviewed under the PSD regulations.

Hence, this project will be a major modification of an existing major stationary source resulting in a net significant increase of PM, PM_{10}, $PM_{2.5}$, and CO_2e. This project will be subject to the various aspects of K.A.R. 28-19-350 such as the use of best available control technology, ambient air quality analysis, and additional impacts upon soils, vegetation and visibility.

The air emissions estimates are shown below:

Pollutant Type	Units 7 & 8 Baseline Actual	Unit 12 Baseline Actual (before Project)	Total Baseline Actual Units 7, 8 & Unit 12 (before Project)	Unit 12 Projected Actual Increase After Project)	Projected Actual Emissions (Unit 12 Combined Cycle Project minus Total Baseline)	*PSD Significance Threshold*
NOx	1120	34	1154	67	-1087	*40*
SO_2	5004	1	5005	12	-4993	*40*
CO	90	3	93	60	-33	*100*
VOC	10	0.3	10.3	47.3	37	*40*
Lead	0.5	--	0.5	4.1×10^{-5}	-0.5	*0.6*
SAM	2	0.1	2.1	6.93	4.83	*7*

HF	25	--	25	$1.69x10^{-5}$	-25	*3*
PM	91	7	98	132	34	*25*
PM_{10}	66	7	73	132	59	*15*
$PM_{2.5}$	26	7	33	132	99	*10*
CO_2e	640,234	123,604	763,838	1,020,590	256,752	*75,000*

V. Best Available Control Technology (BACT)

BACT requirement applies to each new or modified affected emissions unit and pollutant emitting activity. Also, individual BACT determinations are performed for each pollutant emitted from the same emission unit. Consequently, the BACT determination must separately address, for each regulated pollutant with a significant emissions increase at the source, air pollution controls for each emissions unit or pollutant emitting activity subject to review. Empire was required to prepare a BACT analysis for KDHE's review according to the process described in Attachment A. KDHE's evaluation of the BACT for the proposed Emission Reduction Project's analysis is presented in Attachment B.

KDHE has concurred with the Empire for the following:

BACT for Particulate Matter

EMISSION UNIT	CONTROL	EMISSION VALUE
Combined Cycle Unit (CT+HRSG)	Good Combustion Practices Natural Gas	30.2 lb/hr (front + back half)
Auxiliary Boiler	Good Combustion Practices Natural Gas	0.005 lb/MMBtu
Emergency Diesel Generator	Good Combustion Practices Low sulfur fuel oil	0.15g/bhp-hr
Mechanical Draft Cooling Tower	High efficiency drift eliminators	0.0005% drift rate

BACT for CO_2e

EMISSION UNIT	CONTROL	EMISSION VALUE
Combined Cycle Unit (CT+HRSG)	Good Combustion Practices Selected energy efficiency measures	1,022,755.9 tpy on a 12-month rolling average basis
Auxiliary Boiler	Good Combustion Practices	9,521.5 tpy on a 12-month rolling average basis

Emergency Diesel Generator	Selection of the most efficient engine that meets the facility's emergency needs	59.5 tpy of $C0_2e$ on a 12-month rolling average basis
SF6 circuit breakers	Installation of modern, totally enclosed SF6 circuit breakers with density (leak detection) alarms	Guaranteed loss rate of 0.5 % by weight or less per year

VI. <u>Ambient Air Impact Analysis</u>

A. Air Quality Impact Analysis (AQIA) Applicability

1. The proposed facility is a major source as defined by K.A.R. 28-19-350, Prevention of Significant Deterioration (PSD). Major sources with pollutant emissions exceeding significant emission rates must undergo PSD review. The owner or operator must demonstrate that allowable emission increases from the proposed facility would not cause or contribute to air pollution in violation of:

    a. any National Ambient Air Quality Standard (NAAQS) in any air quality control region; or
    b. any applicable maximum allowable increase over the baseline concentration in any area.

2. Emissions from the proposed project and significant emission rate thresholds are listed in Table 1 below.

Table 1. Emissions From the Proposed Project and PSD Significant Emission Rates

Pollutant [a]	**Project Emissions with Controls (tons per year, tpy)**	**Significant Emission Rate (tons per year, tpy)**	**Exceeds Significant Emission Rate?**
NO_x	33	40	No
SO_2	12	40	No
PM	34	25	**Yes**
PM_{10} [b]	59	15	**Yes**
$PM_{2.5}$ [b]	99	10	**Yes**
CO	60	100	No
VOC	37	40	No
Ozone	N/A	40 tpy VOC or 40 tpy NO_x	No

[a] NOx = Nitrogen oxides; SO_2 =Sulfur dioxide; PM = Total particulate matter; PM_{10} = Particulate matter less than 10 micrometers (µm) in diameter; $PM_{2.5}$ = Particulate matter less than 2.5 µm in diameter; CO = Carbon monoxide; and VOC = Volatile organic compounds.
[b] Filterable plus condensable.

B. Model Selection

1. A dispersion model is a computer simulation that uses mathematical equations to predict air pollution concentrations based on weather, topography, and emissions data. AERMOD is the current model preferred by EPA for use in near-field regulatory applications, per 40 CFR Part 51 Appendix W, Section 3.1.2, and Appendix A to Appendix W:

   "AERMOD is a steady-state plume dispersion model for assessment of pollutant concentrations from a variety of sources. AERMOD simulates transport and dispersion from multiple sources based on an up-to-date characterization of the atmospheric boundary layer. AERMOD is appropriate for: point, volume, and area sources; surface, near-surface, and elevated releases; rural or urban areas; simple and complex terrain; transport distances over which steady-state assumptions are appropriate, up to 50 km; 1-hour to annual averaging times; and continuous toxic air emissions."

2. AERMOD modeling system Version 12345 was used to evaluate the impacts of the following pollutant and averaging times from the proposed project:

   a. 24-hour and annual $PM_{2.5}$;
   b. 24-hour PM_{10}.

3. AERMINUTE Version 12345 was used to process 1-minute ASOS wind data to generate hourly average winds for input to AERMET. AERMET Version 12345 was used to prepare meteorological data for the years 2007-2011.

C. Model Inputs

1. Source Inputs

   The source inputs such as emission rates, source types, source locations, stack parameters and other inputs used in the model were based on the data supplied in the permit application Addendum B on Air Dispersion Modeling (received by KDHE on March 5, 2013).

2. Center of the Facility

   The center of the proposed project is located at the following: Zone: 15, Easting: 348,970.6 meters, Northing: 4,104,234.6 meters

3. Modeling scenarios

Details of the modeling scenarios used in the model were included in the permit application addendum on Air Dispersion Modeling.

4. Urban or Rural

A review of United States Geological Survey (USGS) National Land Cover Data (NLCD) for 1992 for the site and a surrounding three (3) kilometer radius was reviewed to determine if rural or urban site classification should be used for modeling. The area was deemed rural for air modeling purposes.

5. Terrain

The proposed project was modeled using the elevated terrain option. AERMAP processor was used to process the National Elevation Data (NED) files from the USGS to interpolate elevations at each receptor.

6. Meteorological Data

KDHE supplied to the facility five (5) consecutive years (2007 through 2011) of meteorological data. The surface data was obtained from the Joplin Regional Airport (KJLN) meteorological station in Missouri. The upper air data was obtained from the Springfield Regional Airport (SGF) meteorological station in Missouri. Table 2 shows additional information about the representative meteorological stations.

Figure 1 shows the wind rose (localized winds patterns) for the cumulative 5-year meteorological data where the prevailing wind originates from the south. Figure 2 shows a map that includes the Empire District-Riverton facility, the KJLN and the SGF airport meteorological stations.

Table 2. Meteorological Data Sites

Station Type	Station Name	WBAN #	Latitude/ Longitude	Elevation (m)	Years of Data
Surface Air Station	Joplin Regional Airport, MO (KJLN)	13987	37.152/ -94.495	296.0	2007-2011
Upper Air Station	Springfield Regional Airport, MO (SGF)	13995	37.239/ -93.389	383.7	2007-2011

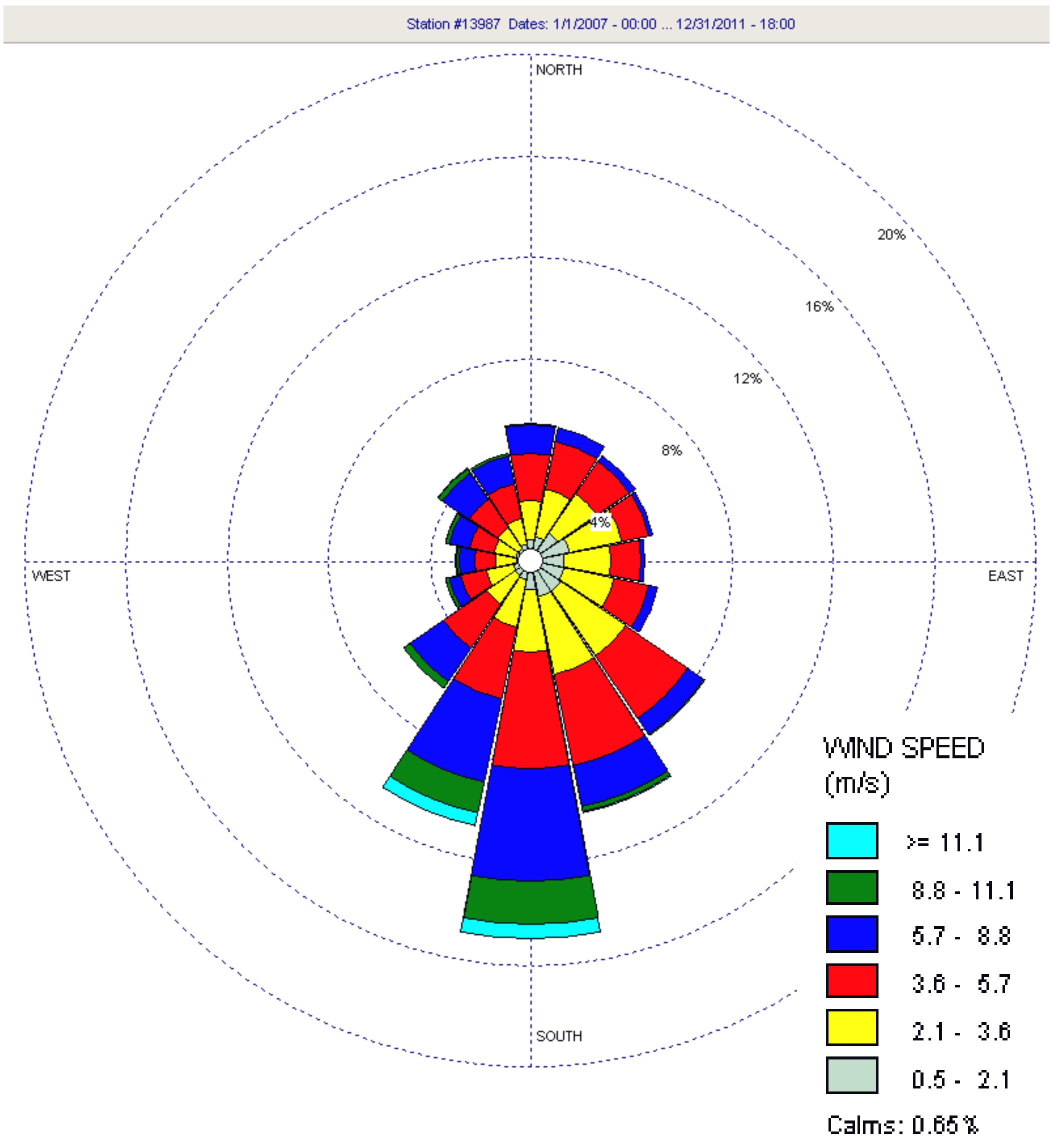

Figure 1. Wind Rose for Years 2007 to 2011

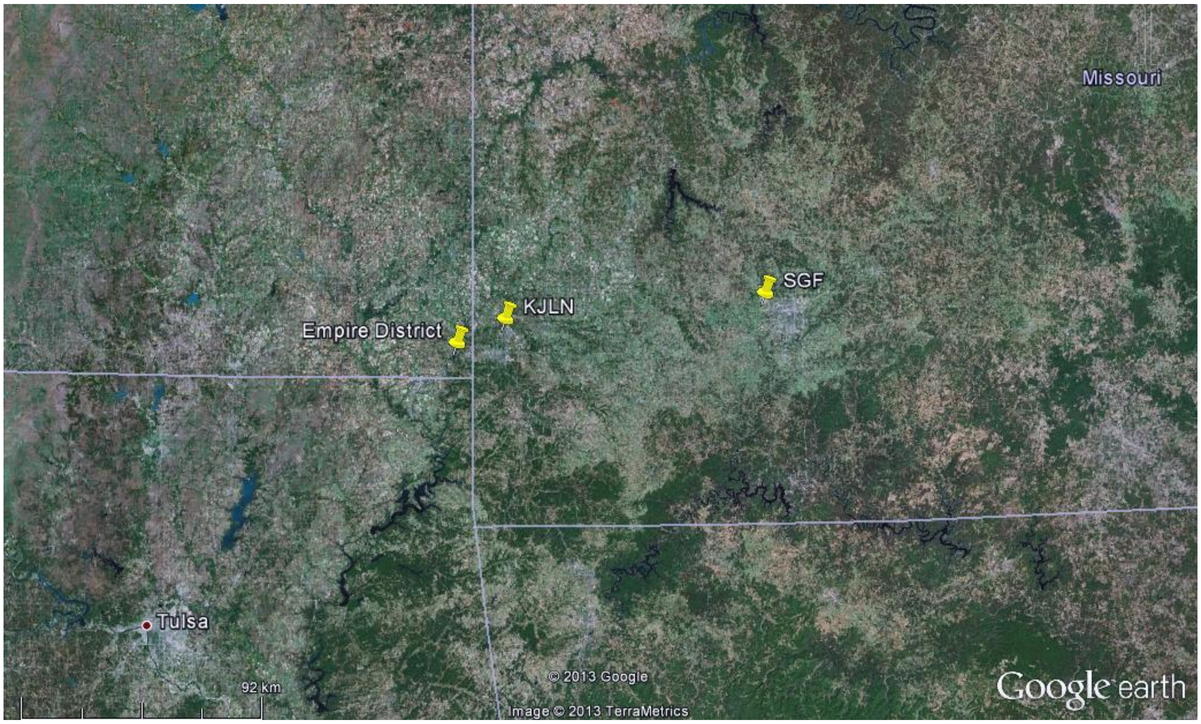

Figure 2. Map showing the Empire District Riverton Plant in Cherokee County in Kansas, the Joplin Regional Airport (KJLN) and the Springfield Regional Airport (SGF) meteorological stations in Missouri.

D. Building Downwash

1. Good Engineering Practice (GEP) stack height for stacks constructed after January 12, 1979 is defined as the greater of

   a. 65 meters, measured from the ground-level elevation at the base of the stack, and

   b. Stack height calculated from the following EPA's refined formula:

      $H_g = H + 1.5L$

      where,

      H_g = GEP stack height, measured from the ground-level elevation at the base of the stack

      H = height of nearby structure(s) measured from the ground-level elevation at the base of the stack

L = lesser of the Building Height (BH) or Projected Building Width (PBW); PBW is the greatest crosswind distance of a building also known as maximum projected width.

2. Emissions released at stack heights greater than GEP are modeled at GEP stack height. Emissions released at or below GEP are modeled at their true release height.

3. Building downwash was calculated using the Building Profile Input Program (BPIP) with plume rise model enhancements (PRIME).

E. Receptors

1. AERMOD estimates ambient concentrations using a network of points, called receptors throughout the region of interest. Model receptors are typically placed at locations that reflect the public's exposure to the pollutant.

2. The minimum receptor spacing used in the dispersion modeling for the proposed project consisted of a multi-tiered grid shown in Table 3.

Table 3. Receptor spacing used in dispersion modeling of the proposed facility

Distance From Facility Boundary (meters)	Receptor Spacing (meters)
Facility Center to 1000	50
1000 to 2,000	100
2,000 to 10,000	250
10,000 to 50,000	1000

3. Receptors along the facility's fenceline were placed at 50 meter spacing.

F. Modeling domain

1. Preliminary (screening) modeling analysis establishes the distance (from the center of the facility) to the farthest receptor with modeled concentration greater than the significant impact level (SIL) thresholds; this is often referred to as the significant impact area (SIA).

2. Full impact (refined) modeling analysis usually uses a modeling domain equivalent to the SIA plus 50 kilometers (km); this is often referred to as the radius of impact (ROI).

G. Preliminary Modeling Analysis

1. In order to determine if a full impact modeling analysis and/or ambient air monitoring is necessary, a preliminary modeling analysis is first conducted.

2. The preliminary analysis only included the proposed project's emission sources to determine if a modeled high first high (HIH) impact (or concentration) will exceed the SIL thresholds. The preliminary modeling results of the proposed project are shown in Table 4.

Table 4. Preliminary/Significance Modeling Results

Pollutant	Averaging Period	Modeled Concentration (High First High, H1H) ($\mu g/m^3$)	Modeling Significant Impact Level (SIL) ($\mu g/m^3$)	Exceeds SIL?	Pre-application Monitoring Threshold Concentration ($\mu g/m^3$)	Exceeds Monitoring Threshold?
$PM_{2.5}$	Annual	**0.11**	**0.3**	**No**	N/A	N/A
	24-hour	**1.08**	**1.2**	**No**	**4**[1]	**No**
PM_{10}	24-hour	**1.31**	**5**	**No**	**10**	**No**

3. For each pollutant and averaging time that the modeled HIH concentration is below the SIL threshold, no further analysis is necessary for that particular pollutant and averaging time. KDHE considers this to be a sufficient demonstration that a project does not cause or contribute to a violation of the NAAQS or PSD increment. Refer to Figures 3, 4, and 5 for SIL modeling isopleths.

4. The modeled H1H impacts of annual $PM_{2.5}$ and 24-hour $PM_{2.5,}$ and 24-hour PM_{10} fall below SIL thresholds. Therefore, full impact (refined) modeling analyses are not required for these pollutants and averaging times.

5. The PSD significant monitoring concentration (SMC) threshold was not exceeded for 24-hour $PM_{10.}$ No SMC currently exists for $PM_{2.5}$ 24-hour in Kansas. However, representative monitoring from the Mine Creek site is available and is approved for use.

[1] The Significant Monitoring Threshold for $PM_{2.5}$ 24-hour averaging period was vacated on January 22, 2013.

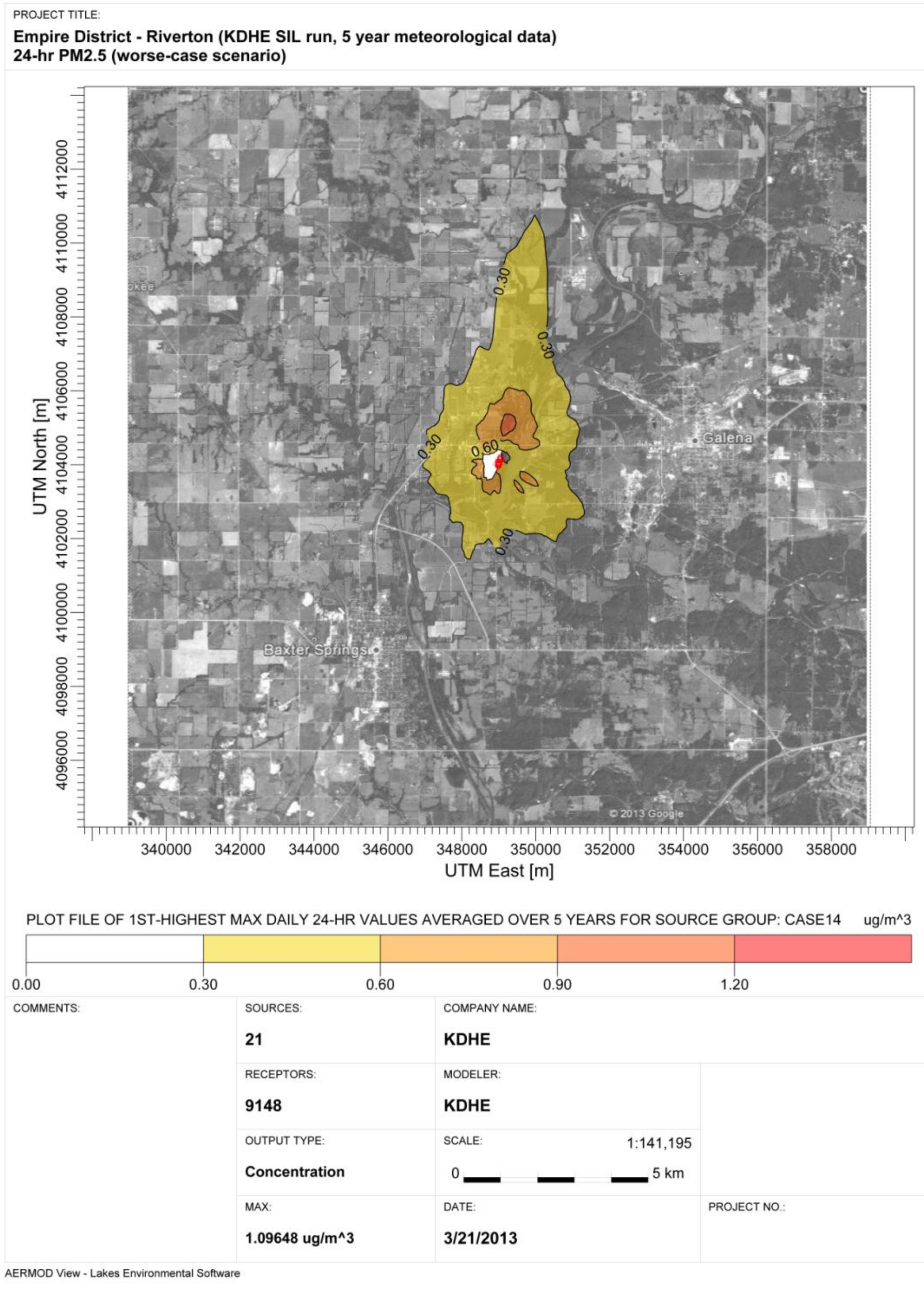

Figure 3. SIL Modeling Isopleths for 24-hr $PM_{2.5}$

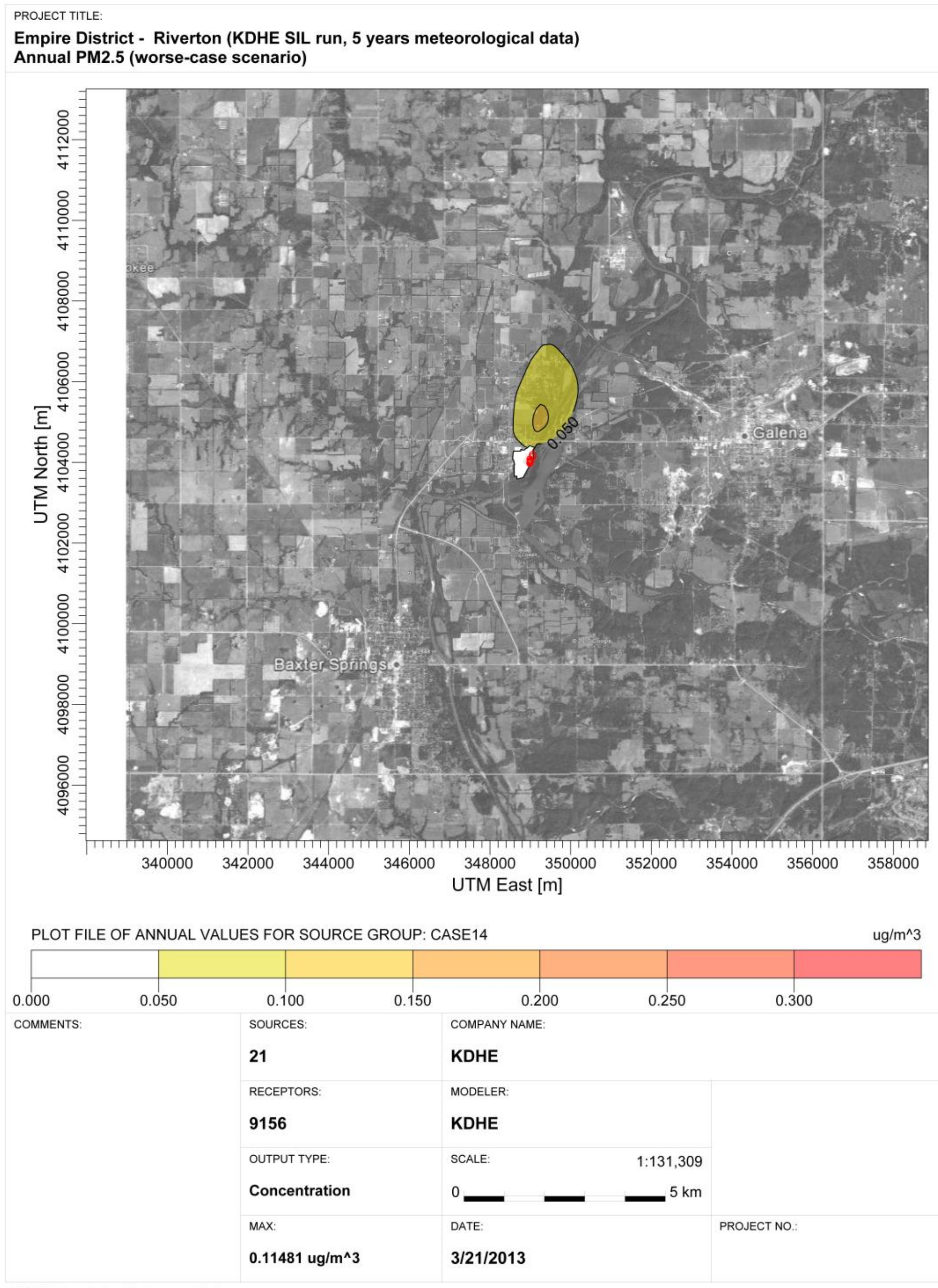

Figure 4. SIL Modeling Isopleths for annual $PM_{2.5}$

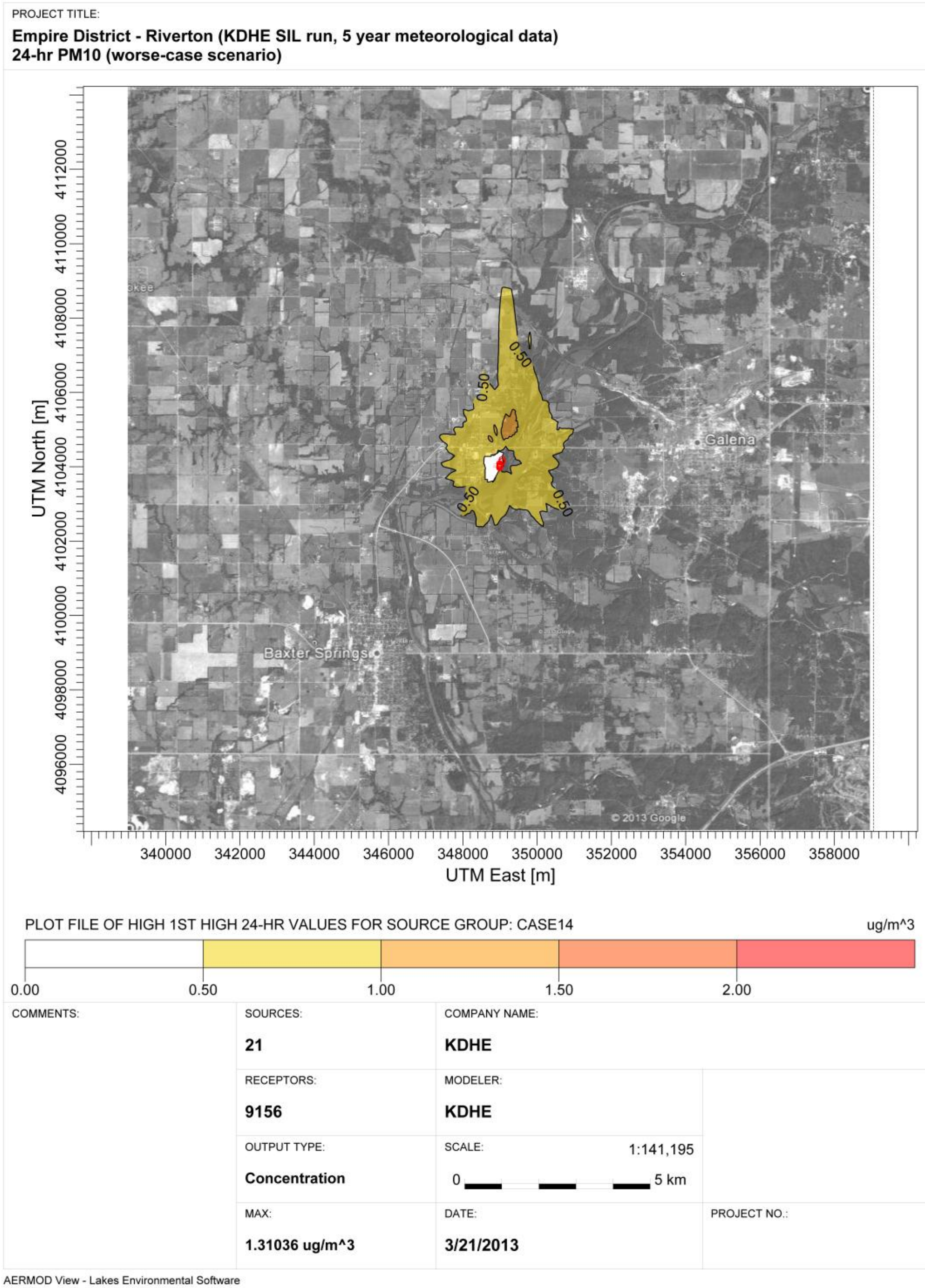

Figure 5. SIL Modeling Isopleths for 24-hr PM_{10}

H. Additional Impact Analysis

In accordance with 40 CFR 52.21(o)(1) and (o)(2), the owner or operator shall provide an analysis of the impairment to visibility, soils, and vegetation that would occur as a result of the proposed project and to what extent the emissions from the proposed construction impacts the general commercial, residential, industrial and other growth.

For a more detailed discussion on the additional impact analysis, please see Section 3.0 of the permit application Addendum B on Air Dispersion Modeling.

1. Visibility Impacts

a. Class I Area

The *Federal Land Manager's Air Quality Related Values Work Group Phase 1 Report, Revised 2010* (FLAG 2010) prescribed a methodology based on facility emissions and distance for determining if a facility needs to conduct a visibility analysis for a Class I area. The methodology states that if a facility is beyond 50 km (31.1 miles) from the nearest Class I area and the quotient of a facility's yearly emissions (based on the maximum 24-hour emission rate) of visibility impairing pollutants: PM_{10}, NO_X, sulfur SO_2, and sulfuric acid mist (H_2SO_4)) divided by the distance in kilometers to the nearest point of a Class I area is less than or equal to 10, further visibility analysis for that Class I area is not needed.

The nearest Class I area to the Riverton facility is Hercules Glades Wilderness area, which at its closest point is 198.2 km (123.2 miles) away. Given this distance, D, and the post-project total emissions of visibility impairing pollutants of 213 tpy, Q, the Q/D ratio is well below 10. Since the Q/D ratio is well below 10, a visibility analysis for Class I areas was not conducted.

b. Class II Area

Empire District analyzed the visibility impacts of two (2) local/ Class II areas, namely: Crawford State Park and Joplin Regional Airport. The Crawford State Park is located approximately 62.3 km (38.7 miles) to the north-northwest of the Riverton facility in Crawford County, Kansas and the Joplin Regional Airport is located approximately 18.9 km (11.7 miles) to the northeast of the Riverton facility in Jasper County, Missouri.

c. Level 2 VISCREEN Analyses

The US EPA VISCREEN screening tool was used to determine the visibility impacts to the Class II areas. The VISCREEN model is designed to determine whether a plume from a facility may be visible from a given vantage point. The primary variables that affect whether a plume is visible or not at a certain location are the quantity of emissions, the types of emissions, the relative location of the emission source and the observer, and the background visibility range.

A visibility impairment screening analyses were performed in accordance with the USEPA's *Workbook for Plume Visual Impact Screening and Analysis* (EPA-450/4-88-015, September 1988, hereinafter referred to as the "Workbook"). The Level 2 VISCREEN screening analysis (which incorporates more representative meteorological parameters compared with Level 1) analysis was conducted by Empire District. Table 3-1 of the Addendum B presents the inputs used in the VISCREEN analysis for both Crawford State Park and Joplin Regional Airport.

The results of the Level 2 VISCREEN analyses presented in Tables 3-2 and 3-3 of Addendum B indicate that the proposed project will not have an adverse impact upon visibility at the selected areas.

2. Soil Impacts

a. A soil inventory was completed by obtaining a soil survey from the Natural Resources Conservation Service (NRCS) within the 3-km radius study area surrounding the facility. The different soil survey classification series that were found to be in excess of one (1) percent of the total land area of the 3-km area of interest are listed in Table 3-4 of permit application Addendum B on Air Dispersion Modeling. A complete breakdown of the percentage of each soil survey classification series is provided in Appendix C of the permit application.

b. As presented in Section 2.8 of permit application Addendum B on Air Dispersion Modeling, the maximum model-predicted 24-hour PM_{10} and $PM_{2.5}$ impacts are 1.31 $\mu g/m^3$ and 1.08 $\mu g/m^3$, respectively, which are significantly less than the 24-hour secondary NAAQS of 150 $\mu g/m^3$for PM_{10} and 35 $\mu g/m^3$ for $PM_{2.5}$. Because the predicted particulate air quality impacts are below the NAAQS, the facility concluded that the proposed emissions of $PM_{10}/PM_{2.5}$ are unlikely to affect soils.

3. Vegetation Impacts

a. Quantitative Impacts

i. As presented in Section 2.8 of permit application Addendum B on Air Dispersion Modeling, the maximum model-predicted 24-hour PM_{10} and $PM_{2.5}$ impacts are 1.31 $\mu g/m^3$ and 1.08 $\mu g/m^3$, respectively, which are significantly less than the 24-hour secondary NAAQS of 150 $\mu g/m^3$ for PM_{10} and 35 $\mu g/m^3$ for $PM_{2.5}$. Because the predicted particulate air quality impacts are below the NAAQS, the facility concluded that the proposed emissions of $PM_{10}/PM_{2.5}$ are unlikely to affect vegetation.

b. Qualitative Impacts

i. Particulate Matter

Particulate pollution can decrease sunlight available to vegetation, both directly through the coating of foliage and indirectly through regional haze. According to the facility, it is highly unlikely that the proposed project's particulate emissions will impact surrounding vegetation given the small magnitude of projected emissions and the relatively efficient and clean combustion associated with natural gas-fired combined cycle unit.

ii. Carbon Dioxide

CO_2 is not known to injure plants. As such, no adverse impacts to vegetation are expected from the CO_2 emissions associated with the proposed project.

4. Commercial, Residential, and Industrial Growth Impacts

a. The proposed project is located in Cherokee County on the southeastern side of the unincorporated town of Riverton along the western bank of the Spring River. The purpose of the project is to replace the generating capacity of Units 7 and 8, which are being retired. Because the project will not create any additional generating capacity, it is not expected to have an effect upon the industrial growth in the immediate area.

b. During the construction phase of the project, which is expected to last around 24 months, there will be a temporary increase in the local labor force. It is anticipated that most of the labor force during the construction phase will commute from nearby communities. Because the increase in the local labor force is expected to be temporary and relatively short-lived, it is not expected to result in permanent commercial and residential growth occurring in the vicinity of the project.

I. Summary and Conclusions for the Ambient Air Impact Analysis

1. The results of the modeling analysis are summarized in Table 2-4 of the permit application Addendum B on Air Dispersion Modeling (received by KDHE on March 5, 2013).

2. The modeled H1H impacts of annual $PM_{2.5,}$ 24-hour $PM_{2.5,}$ and 24-hour PM_{10} fall below SIL thresholds. Therefore, full impact (refined) modeling analyses are not required for these pollutants and averaging times.

3. The PSD significant monitoring concentration (SMC) threshold was not exceeded for 24-hour $PM_{10.}$ No SMC currently exists for $PM_{2.5}$ in Kansas. However, representative monitoring from the Mine Creek site is available and is approved for use.

4. The results of the Level 2 VISCREEN analyses presented in Tables 3-2 and 3-3 of the permit application Addendum B indicate that the proposed project will not have an adverse impact upon visibility at the selected areas.

5. Because the predicted 24-hour PM_{10} and $PM_{2.5}$ impacts air quality impacts are below the NAAQS, the facility concluded that the proposed emissions of PM_{10}/$PM_{2.5}$ are unlikely to affect soils and vegetation.

6. Because the project will not create any additional generating capacity, the facility is concluded that the project will not have an effect in the industrial growth in the immediate area.

7. Because the increase in the local labor force is expected to be temporary and relatively short-lived, the facility concluded that the project will not result in permanent commercial and residential growth occurring in the vicinity of the project

8. KDHE concludes that Empire District has sufficiently demonstrated that the proposed project will not cause or contribute to a violation of any NAAQS or PSD increment; and that the proposed project has no adverse impact on visibility; vegetation, soils and animals; and in industrial, commercial and residential growth.

Attachment A

KEY STEPS IN THE "TOP-DOWN" BACT ANALYSIS

STEP 1: IDENTIFY ALL POTENTIAL AVAILABLE CONTROL TECHNOLOGIES.

The first step in a "Top-Down" analysis is to identify, for the emission unit in question, "all available" control options. Available control options are those air pollution control technologies or techniques with a PRACTICAL POTENTIAL FOR APPLICATION to the emissions unit and the regulated pollutant under review. This includes technologies employed outside of the United States. Air pollution control technologies and techniques include the application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of the affected pollutant.

STEP 2: ELIMINATE TECHNICALLY INFEASIBLE OPTIONS.

The technical feasibility of the control options identified in Step 1 is evaluated with respect to the source-specific (or emissions unit specific) factors. In general, a demonstration of technical infeasibility should be clearly documented and should show, based on physical, chemical, and engineering principles, that difficulties would preclude the successful use of the control option on the emissions unit under review. Technically infeasible control options are then eliminated from further consideration in the BACT analysis.

STEP 3: RANK REMAINING CONTROL TECHNOLOGIES BY CONTROL EFFECTIVENESS.

All remaining control alternatives not eliminated in Step 2 are ranked and then listed in order of over-all control effectiveness for the pollutant under review, with the most effective control alternative at the top. A list should be prepared for each pollutant and for each emissions unit subject to a BACT analysis. The list should present the array of control technology alternatives and should include the following types of information:

1) control efficiencies;
2) expected emission rate;
3) expected emission reduction;
4) environmental impacts;
5) energy impacts; and
6) economic impacts.

STEP 4: EVALUATE MOST EFFECTIVE CONTROLS AND DOCUMENT RESULTS.

The applicant presents the analysis of the associated impacts of the control option in the listing. For each option, the applicant is responsible for presenting an objective evaluation of each impact. Both beneficial and adverse impacts should be discussed and, where possible, quantified. In general, the BACT analysis should focus on the direct impact of the control alternative. The applicant proceeds to consider whether impacts of unregulated air pollutants or impacts in other media would justify selection of an alternative control option. In the event the top candidate is shown to be inappropriate, due to energy, environmental, or economic impacts, the rationale for this finding should be fully documented for the public record. Then the next most stringent alternative in the listing becomes the new control candidate and is similarly evaluated. This process continues until the technology cannot be eliminated.

STEP 5: SELECT BACT.

The most effective control option not eliminated in Step 4 is proposed as BACT for the emission unit to control the pollutant under review.

Attachment B

KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT'S EVALUATION OF EMPIRE DISRICT ELECTRIC COMPANY RIVERTON POWER STATION UNIT 12 COVERSION TO COMBNED CYCLE PROPOSED BEST AVAILABLE CONTROL TECHNOLOGY (BACT) OPTIONS

Empire District Electric Company (Empire) evaluated the BACT analysis to control emissions from the Emission Reduction Project. The only significant emission increases from this project are particulate matter (PM), PM with a diameter less than 10 microns (PM_{10}), PM with a diameter less than 2.5 microns ($PM_{2.5}$), and carbon dioxide equivalent (CO_2e).

BACT Analysis for PM, PM_{10}, $PM_{2.5}$ for the Conversion Project

The BACT analysis for PM, PM_{10}, $PM_{2.5}$ controls is provided in Empire's PSD air construction permit application: Addendum – Particulate Matter BACT Analysis, Riverton Facility, Unit 12 Conversion to Combined Cycle Project. The controls are listed below. The PSD regulations require BACT and BACT requires the source to evaluate the control options for technical feasibility. Based on the technical constraints, emission levels as shown below are proposed by Empire as BACT. KDHE agrees with this analysis.

Emission Unit	Control	Emission Value
Combined Cycle Unit (CT + HRSG)	Good Combustion Practices Natural Gas	30.2 lb/hr (front + back half)
Auxiliary boiler	Good Combustion Practices Natural Gas	0.005 lb/MMBtu
Emergency Diesel Generator	Good Combustion Practices Low sulfur fuel oil (<15 ppm sulfur)	0.15 g/bhp-hr
Mechanical Draft Cooling Tower	High efficiency draft eliminators	0.0005 % drift rate

BACT Analysis for Carbon Dioxide Equivalents - Greenhouse Gas (CO_2e – GHG) for the Conversion Project

The BACT analysis for Greenhouse Gases or Carbon Dioxide Equivalents (CO_2e) controls is provided in Empire's PSD air construction permit application: Addendum – Greenhouse Gas BACT Analysis, Riverton Facility, Unit 12 Conversion to Combined Cycle Project. In accordance with the GHG Tailoring Rule effective July 1, 2011, new stationary sources emitting greater than 100,000 tons per year of CO_2e are subject to PSD requirements and BACT review in accordance with 40 CFR Part 52.21.

CO_2e controls are listed below. The PSD regulations require BACT, which requires the source to evaluate the control options for technical feasibility. Based on the technical constraints, emission levels as shown below are proposed by Empire as BACT. KDHE agrees with this analysis.

Emission Unit	Control	Emission Value
Combined Cycle Unit and Duct burners	Good Combustion Practices Selected energy efficiency measures	1,022,755.9 tpy of $C0_2e$ on a 12-month rolling average basis
Auxiliary boiler	Good Combustion Practices	9,521.5 tpy of $C0_2e$ on a 12-month rolling average basis
Emergency Diesel Generator	Selection of the most efficient engine that meets the facility's emergency needs	59.5 tpy of $C0_2e$ on a 12-month rolling average basis
SF_6 Insulated Circuit Breakers	Installation of modern, totally enclosed SF6 circuit breakers with density (leak detection) alarms and a guaranteed loss rate of $\leq$ 0.5 % by weight per year	0.00029 tpy of sulfur hexafluoride (6.9 tpy $C0_2e$)